Collider Run II Shot Setup Documentation

Created by Brian Drendel 3-24-04
Last Edit by Brian Drendel 4-3-05
Send suggestions and comments to drendel@fnal.gov.

Sequencer: **Pbar**
Collider Aggregate: **Run II Start Shot Setup**
Previous Aggregate: None
Pre-cool the Core: We want to cool the core frequency width to 15Hz longitudinally before switching to the shot lattice. When the stack is large, we turn off stacking before starting shot setup in order to start the cooling process. The idea is to time there termination of stacking such that we do not stop stacking too early where we would lose valuable stacking time, and at the same time do not stop stacking too late where Pbar would delay the shot setup while trying to cool to 15Hz. The cooling process can be speeded up by using the 4-8GHz momentum cooling as outlined in http://www-bdnew.fnal.gov/pbar/organizationalchart/drendel/TuningGuide/ShotsWith4
Preparing to Start Shot Setup: This aggregate is run to begin the shot setup process for Pbar. The Pbar sequencer requires two dedicated MCR consoles plus two MCR comfort displays. Normally, CNS1 is used to run the Pbar sequencer, CNS101 is used for the Pbar life-o-meter, CNS2 is used for emittance plots and the Pbar longitudinal display, and CNS102 is used for the Pbar Radiation Detector Display.
When to Start this Aggregate? The Shot Scrapbook (http://www-bd.fnal.gov/cgi-mach/machlog.pl?nb=scrap03&load=no) contains data and screen captures collected from all of the sequencers during the shot setup. Each shot setup has a separate shot scrapbook chapter. The chapter is incremented by the Tevatron sequencer, so it is important to wait to start this aggregate until after the Tevatron has started the new shot scrapbook chapter.
Purpose of this Aggregate: The **Run II Start Shot Setup** aggregate is the first aggregate issued for Pbar when doing a shot setup. This aggregate stops stacking, starts comfort display and emittance plots, checks Accumulator BPMs, toggles state devices, loads a TLG with reverse proton events, starts momentum thermostat, sets up the unstacking display on SA#2, sets up the AP1 and AP3 lines for 8 GeV beam, and toggles alarm lists.
::: INSTRUCT 200 .

```
   This aggregate and the following 8:
Run II Start Reverse Protons,
Run II Switch to Shot Lattice,
Run II Finish Reverse Protons,
Run II Continue Shot Set Up,
Run II Prepare to Load Pbars,
Run II Load Collider Pbars,
Run II Revert to Stack Lattice,
Run II Return to Stacking provide the means for setting up the Pbar
source to do pbar transfers to the Main Injector and/or Tevatron.

Each aggregate's title describes the activities contained within the
aggregate. Instructions provided along the way hopefully make the
process fairly painless under normal circumstances.

  ***Scan the most recent Pbar/Shots log books for anything that
     may affect the shot set-up.***

           Interrupt anywhere in this box to continue.
```

::: SHOT_LOG COMMENT .

Enters the following comment into the Pbar portion of the shot scrapbook at http://www-bd.fnal.gov/cgi-mach/machlog.pl?nb=scrap03.

Time- Starting Pbar Shot Set Up; the stack size is ##.####. - Sequencer

::: BEAM_SWITCH Pbar_Source Off .

To avoid taking beam to Pbar while switching form 120GeV stacking mode to 8GeV shot mode, we take the software beam switch.

::: NOTIFY Start .

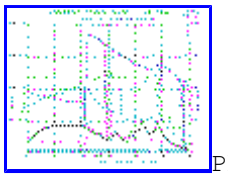
Sends a Channel 13 Notify message to http://www-bd.fnal.gov/cgi-bin/notify_mes.pl?ch13=text.

::: CTLIT_DEVICE D:Q731 OFF D

The command is bypassed. We used to turn off the AP2 line quadrupole power supply D:Q731 for shot setup, there used to be overheating problems with certain magnets, that would require periodic flushing of their LCW lines. Turning the device off was intended to extend the time between flushes.

::: START_PGM SA1144 . .

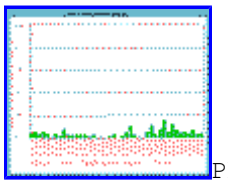
Starts the Stack-o-meter SA (keeper is David Sutherland)on comfort display console 101. If this plot dies, it can easily be restarted as follows. From CNS1, do a CNTL-SHIFT-4 to get to the CNS101 comfort display. Go to P69 and then click PLOT!! under the lifetime category.


Pbar Life-o-Meter. Click on thumbnail to view full-sized image.

::: START_PGM SA1127 .

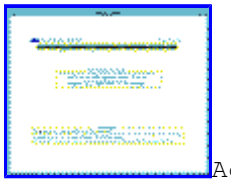
Pbar Radiation Detector Display (keeper is Tony Leveling)on comfort display 102. This SA can be used during the beam line tune-up to verify that radiation levels are not high enough to cause a radiation trip. The program emulates the actions of the radiation detector cards. It updates every 60 seconds and takes a 15 minutes rolling average of the radiation losses and normalizes each radiation detector so that a value of 1 corresponds to the radiation trip level. The parameters for the individual radiation detectors can be found on D106 ACC/DEB < 1> to < 3>. G:RA{####} is an integrating real-time read back of the radiation detector. Every 60 seconds, which is not concurrent with the supercycle, G:RA{####} is reset to zero and starts

integrating all over again. G:RD{####} takes the number of G:RA{####} before it is reset and keeps that value until G:RA{####} is reset again. When doing the reverse proton tune-up later in the shot, if any radiation detector gets near to 1 on the plot, the beam switch should be taken to avoid a radiation trip. If the SA1127 plot dies, it can be restarted by reissuing this command, or manually through Acnet page P151. A screen capture of SA1127 is shown below.


Pbar Radiation Detector Display. Click on thumbnail to view full-sized image.

::: START_PGM P162 .

Starts the Accumulator BPM TBT Page P162 (keeper is Keith Gollwitzer). This page, as shown below, checks the status of the Accumulator BPM houses and issues resets to any house that is not online. This allows plenty of time for the BPM houses to reboot before they are need in the beam line tune-up. Upon completion, this application will self terminate and the window will close on its own.


Accumulator BPM page. Click on thumbnail to view full-sized image.

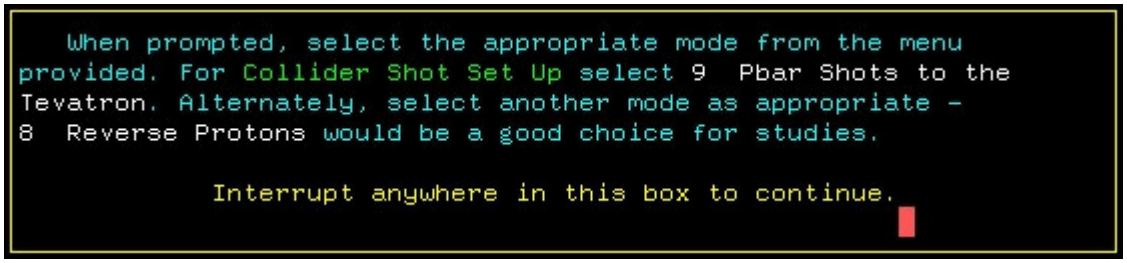
::: WAIT_FOR SECS 30 .

A 30 second delay to allow the Accumulator BPM program above to complete its BPM house check.

::: SETIT_DEVICE V:PSHOOT =1 .

Devices that start with V: are state parameters. State parameters define the operational state of a device or accelerator, allow the sequencers to be more automated, and prevent the different sequencers from getting out of sequence with each other. Often one sequencer waits at a certain spot until another sequencer changes a state parameter. V:PSHOOT is a state parameter for the Pbar transfer state. V:PSHOOT state 1 means "not ready for transfer." In the next aggregate, Pbar **Run II Start Reverse Protons**, V:PSHOOT is set to 4 ("Ready for Main Injector Tune up"). The **Main Injector Shot Transfer Line Tuneup** aggregate waits for PSHOOT to be set to 4 ("Ready for Main Injector Tune up") before starting its beam line tune-up. Later on during the shot, when the beam line tune up is complete, the **Run II Continue Shot Setup** aggregate will change V:PSHOOT to 5 ("Pbar Shot Setup Complete"). The Collider sequencer waits for V:PSHOOT to be set to 5 before loading final protons.

::: INSTRUCT 202 .



::: SET_ENUMERATED V:APSMOD .

V:APSMOD is a state parameter representing the operational mode of the Pbar Source. The **set_enumerated** command asks the user to selected from a menu of V:APSMOD state values as shown below. Some common values for V:APSMOD

include: 7 = Stacking, 8 = Reverse Protons, 9 = Pbar Shots to the Tevatron, and 12 = Pbar Shots to the Recycler. As the above instruct suggests, selecting state 9 ("Pbar Shots to the Tevatron") would be appropriate for RunII Collider Shot Setup.

```
1   Shutdown
2   Access
3   Diagnosing Failure
4   Repairing Failure
5   Recovery / Turn On
6   Standby
7   Stacking
8   Reverse Protons
9   Pbar Shots to the Tevatron
10  Deceleration
11  Store
12  Pbar Shots to the Recycler
```

::: SET_ENUMERATED V:PBSRC .

V:PBSRC is a state parameter representing the source or Pbars for the Tevatron. The **set_enumerated** command asks the user to selected from a menu of V:PBSRC state values as shown below. There are three choices: 1 = Pbars from Accumulator only, 2 = Pbars from Recycler only, and 3 = Pbars from both Accumulator and Recycler.

```
1   Pbars from the Accumulator
2   Pbars from the Recycler
3   Pbars from both Accumulator and Recycler
```

::: SET_DEVICE A:APSHOT +=1 .

Increments the Pbar transfer series number by one. This number is incremented before and after any Pbar transfer from the Accumulator to the Tevatron or Accumulator to the Recycler.

::: ACL WAIT_FOR_READING_MATCH .

Runs an Accelerator Command Language (ACL) script called WAIT_FOR_READING_MATCH that waits for "SDA Shot/Store #" (A:FILE) to read the same value as the Pbar transfer series number (A:APSHOT). More information on ACL scripts can be found at http://adcon.fnal.gov/userb/www/controls/clib/intro_acl.html.

::: SET_DEVICE A:SHTNUM =0 .

Sets the "Pbar transfer series Shot #" parameter (A:SHTNUM) to zero. Later on during the Run II Load Collider Pbars aggregate, A:SHTNUM is incremented by one for every Pbar transfer. So the first transfer has A:SHTNUM = 1, the second transfer has A:SHTNUM = 2, ... ninth transfer has A:SHTNUM= 9.

::: SET_DEVICE V:CASPBT =1 .

The "Pbar transfer SDA case trigger" state (V:CASPBT) is set to 1, which represents "Set up." The sequencer will again change this state parameters in the **Run II Continue shot setup** aggregate. Possible values for this state parameter include: 1 = Set up, 2 = Unstack Pbars, 3 = Transfer Pbars from Accumulator to Main Injector, 4 = Accelerate Pbars in the Main Injector, 5 = Coalesce Pbars in the Main Injector.

::: SET_DEVICE V:SETPBT =1 .

Sets the "Pbar transfer SDA set in case" state device to 1. This state parameter is later set to 5 in the **Run II Load Collider Pbars** and the **Run II Return to Stacking** aggregates. D88 currently shows no state information descriptions for the different states of this parameter. set

::: CHECK_DEVICE A:APSHOT READING .

Prints the value of the "Pbar Transfer Series Number" parameter (A:APSHOT) in the message window at the bottom of the sequencer in the following format.

COM: A:APSHOT present value = #####.00000

::: CTL_DEVICE A:ISHUTO OFF .

Turns off the accumulator injection shutter open timer. The Accumulator injection shutter will now not be told to open.

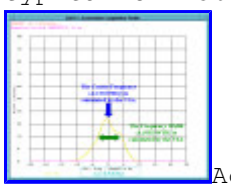
::: CTL_DEVICE A:ESHUTO OFF .
Turns off the accumulator extraction shutter open timer. The Accumulator extraction shutter will now not be told to open.
::: CTL_DEVICE A:ISHUTC ON .
Turns on the accumulator injection shutter close timer. The shutter open timer was disabled and the shutter closed timer was enabled. This ensures that the Accumulator Injection shutter stays closed. The Accumulator injection shutter position can be verified by looking at A:ISHTST. A reading of 1 means open and a reading of 2 means closed. The Accumulator injection shutter controller is located in the top of rack B17R01 at AP10 as shown below.


Click on thumbnail to view full-sized image.

::: CTL_DEVICE A:ESHUTC ON .
Turns on the accumulator extraction shutter close timer. The shutter open timer was disabled and the shutter closed timer was enabled. This ensures that the Accumulator Extraction shutter stays closed. The Accumulator extraction shutter position can be verified by looking at A:ESHTST. A reading of 1 means open and a reading of 2 means closed. The Accumulator extraction shutter controller is located in the middle of rack B17R01 at AP10 as shown below.


Click on thumbnail to view full-sized image.

::: START_PGM SA1136 .
Accumulator Momentum profile using the VSA (keeper is Dave McGinnis). This is normally run on the SC screen of the console that runs the Pbar Sequencer, and can be restarted from P142. SA1136 calculates the center frequency (A:CENFRQ) and frequency width (A:FRWDTH) of the Accumulator beam. If the momentum cooling is being run too hard, you will see a coherent spike on the display. If bad enough, the coherent spike can be larger than the plot scale. This is in indication of an instability, and it also effects the VSA calculations (for example, it makes the frequency width artificially small). If coherent spikes are seen on the trace, you can lower the 2-4GHz momentum power until the spike goes away. A:SPIKE is a datalogged parameter that measures how bad the coherent spike is on the VSA display. Values above 20% can indicate excessive coherent spikes on the display. Below is a typical SA1136 display that is not exibiting coherent spike problems.


Accumulator Momentum Distribution. Click on thumbnail to view full-sized image.

The VSA display can also be viewed on CATV Pbar #16 as shown here.

The hp 89440A VSA is located in the AP10 control room in rack A14R04 as shown here.

 Click on thumbnail to view full-sized image.

What if the VSA plot dos not start? Occasionally the VSA will not start. When that is the case, follow the directions in the Pbar Elog at http://www-bd.fnal.gov/cgi-mach/machlog.pl?nb=pbar04&action=view&page=19&anchor=174245&hilite=17:42:45-%20target=_top to configure the VSA.

::: WAIT_FOR SECS 15 .

Delay to allow SA1136 to start.

::: SETIT_DEVICE A:VSAFWD =15 .

Sets the desired accumulator frequency width to 15Hz. We want to reach this frequency width before later switching to the shot lattice.

::: SETIT_DEVICE A:DTMHVE =.5 .

Sets the horizontal minus vertical emittance difference for VSA vertical thermostat. This is not currently necessary because next command puts the VSA in momentum thermostat only mode. If the VSA is in momentum and vertical thermostat mode (A:VSARST = 7), then this parameter would be used to determine when to turn off the vertical cooling. When running in this mode, if the difference between the horizontal and vertical emittances becomes greater than A:DTMHVE, then the vertical cooling is gated off.

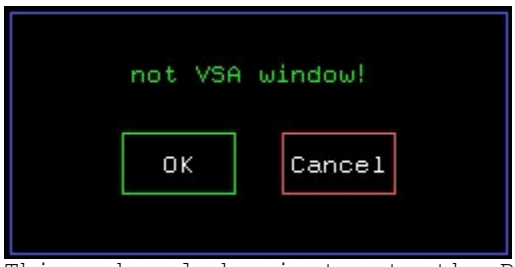
::: SETIT_DEVICE A:VSARST = 5 .

Puts the VSA in momentum thermostat mode. The thermostat tries to keep the frequency width A:FRWDTH (measured by the VSA above) at the desired frequency A:VSAFWD (set to 15 above). The momentum cooling is gated on as long as the frequency width is larger than the desired frequency.

::: ACKNOWLEDGE .

This acknowledge instructs the Pbar sequencer operator that the next plot should be started on this console.

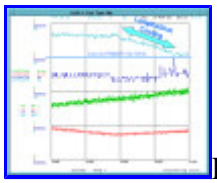
::: ACKNOWLEDGE .



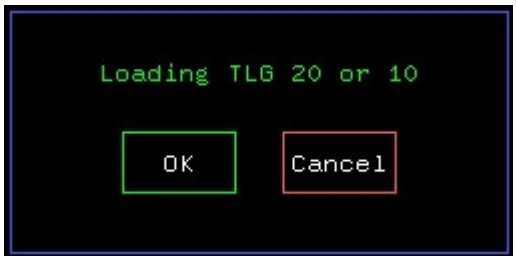
This acknowledge instructs the Pbar sequencer operator not to start the Fast Time Plot on the same slot as the VSA SA is running. Normally the VSA is run on SC.

::: AUTO_PLOT Core Emittances .

Starts a Fast Time Plot that contains A:EMT3HN (0-4 pi-mm-mrad), A:EMT3VN (0-4 pi-mm-mrad), A:CENFRQ (62885-628890 Hz) and A:FRWDTH (0-20 Hz) over time (0-1200 sec). Our target A:FRWDTH is 15Hz.

 Example plot showing core cooling at the beginning stages of shot setup.

::: ACKNOWLEDGE .



This acknowledge informs the Pbar Sequencer Operator that a new TLG is about to be loaded. .

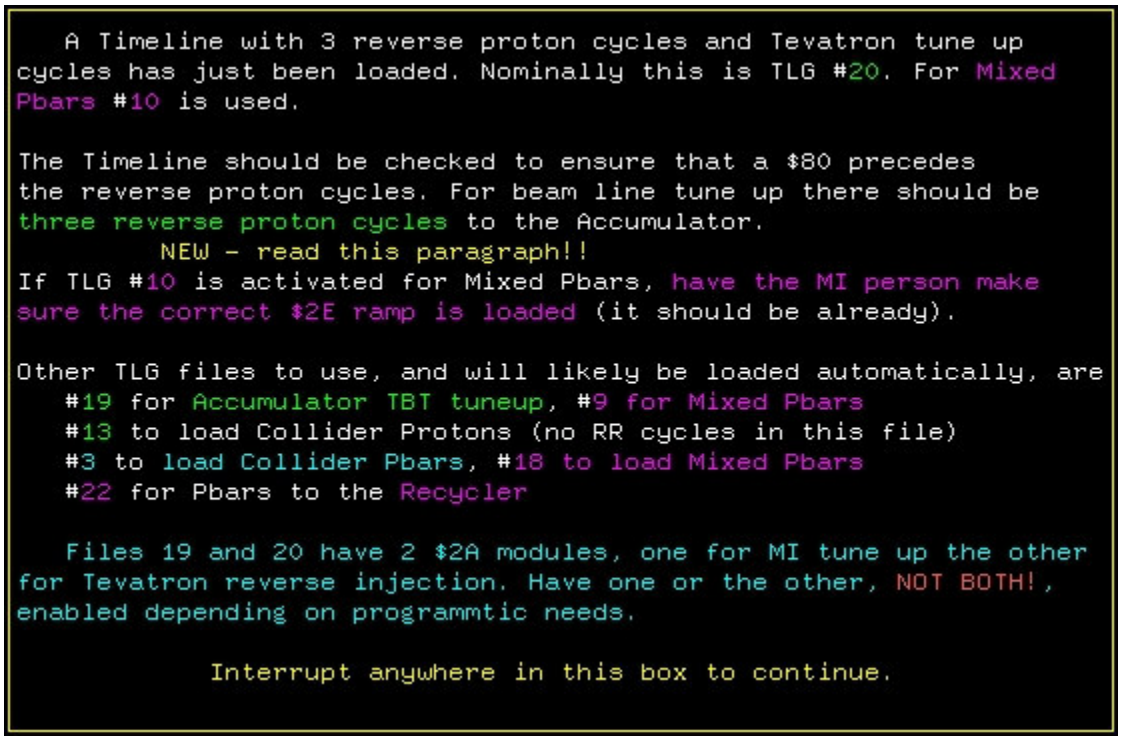
::: LOAD_TLG 10 REPEAT .

Loads TLG #10. See instruct below for more information on the TLGs. TLG #10 is used for Combination Shots (Accumulator and Recycler), while TLG #20 is used for Accumulator-only shots.

::: WAIT_DEVICE G:TLGSEQ .

Waits for TLG #10 to be loaded before continuing.

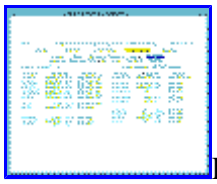
::: INSTRUCT 204 .



This instruct provides the Pbar sequencer operator with instructions to insure the proper TLG is loaded. On 3/9/05 a new instruction was added to remind the sequencer operator to have the Main Injector sequencer operator verify that the correct $2E ramp is loaded if TLG #10 is being used in Combination Shots (Accumulator and Recycler).

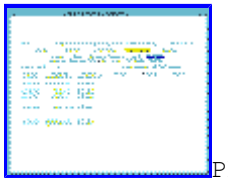
::: ALARM_LIST PBAR 23 .

Bypasses the D59 alarm list entitled “PULSED” (pulsed devices).


Pbar alarm list 23 after it has been bypassed by the Pbar Sequencer. Click on thumbnail to view full-sized image.

```
::: WAIT_FOR SECS 3                .
::: ALARM_LIST PBAR 52             .
```

Bypasses the D59 alarm list entitled "ARF1".


Pbar alarm list 52 after it has been bypassed by the Pbar Sequencer.. Click on thumbnail to view full-sized image.

```
::: SET_SEQ FILE 1                 .
```

File #1 first turns off the pulsed devices.

```
D:LNV    TURN DEVICE OFF                                    ok
D:PMAGV  TURN DEVICE OFF                                    ok
D:ISEPV  TURN DEVICE OFF                                    ok
D:IKIK   TURN DEVICE OFF                                    ok
D:EKIK   TURN DEVICE OFF                                    ok
D:EKIKQ  TURN DEVICE OFF                                    ok
D:ESEPV  TURN DEVICE OFF                                    ok
A:ISEP1V TURN DEVICE OFF                                    ok
A:ISEP2V TURN DEVICE OFF                                    ok
A:IKIK   TURN DEVICE OFF                                    ok
```

File #1 then turns off ARF1.

```
A:R1L1AM TURN DEVICE OFF                                    ok
A:R1L2AM TURN DEVICE OFF                                    ok
A:R1HLSC TURN DEVICE OFF                                    ok
```

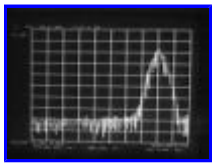
File #1 then disables the A:EXTRAT Pbar extraction parameter and sets Accumulator extraction kicker timing.

```
A:EXTRAT EVENT DISABLE                                      ok
A:EKIKTG SET DEVICE          13.8365                        ok
```

File #1 then turns off some AP2 line devices.

```
D:Q701   TURN DEVICE OFF                                    ok
D:Q702   TURN DEVICE OFF                                    ok
D:H704   TURN DEVICE OFF                                    ok
::: WAIT_FOR SECS 3                .
::: SPECTRUM_LOAD 2  7             .
```

Downloads P41 file #7 to spectrum analyzer #2. This is the Accumulator unstacking display which can be viewed at CATV Pbar #28.


Spectrum Analyzer #2 is located at AP30 in rack B33R03 as shown here.

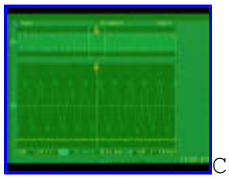

Click on the thumbnail to view a full-sized version of the image.

```
::: SEQ_PGM REQUEST AP0 Scope      .
```

Starts Acnet Program P188 (keeper is Jim Budlong). The Request qualifier tells the application to load file 13, which is used to setup the AP0 wall current monitor scope for capturing Pbar unstacking events. The P188 window automatically closes when the file load is complete.

 Acnet application P188. Click on the thumbnail to view a full-sized version of the image.

The wall current monitor can be viewed on CATV Pbar #7 as shown here.

 Click on the thumbnail to view a full-sized version of the image.

The wall current monitor scope is at AP0 in rack THSBSR3 as shown here. It is triggered off of the AP1 Wall Current Monitor Gate Trigger M:AP1WCS (MIBS $79/$7E + 14.213836), which is setup later on in this aggregate in sequencer File 79.

 Click on the thumbnail to view a full-sized version of the image.

::: CHECK_DEVICE A:R2DDS1 SAVE_SET .

The CHECK_DEVICE command, with the SAVE_SET option, reads and saves the current value of a device. In this case, the ARF2 Stabilizing RF frequency setting is read and saved so that it can be restored when returning to stacking later.

::: CHECK_DEVICE A:R2LLAM SAVE_SET .

The CHECK_DEVICE command, with the SAVE_SET option, reads and saves the current value of a device. In this case, the ARF2 Stabilizing RF frequency amplitude is read and saved so that it can be restored when returning to stacking later.

::: CHECK_DEVICE A:DPHATT SAVE_SET .

The CHECK_DEVICE command, with the SAVE_SET option, reads and saves the current value of a device. In this case the horizontal damper attenuator value is saved before it is set in the next command in this aggregate.

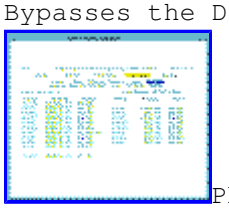
::: SET_DEVICE A:DPHATT =5 .

Sets the accumulator horizontal damper attenuator to 5.

::: INSTRUCT 206 .

::: ALARM_LIST PBAR 2 .

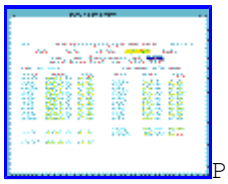
Bypasses the D59 alarm list entitled “AP1 120”.

 Pbar alarm list 2 after it has been bypassed by the Pbar

Sequencer.. Click on thumbnail to view full-sized image.

```
::: WAIT_FOR SECS 3                .
::: ALARM_LIST PBAR 3              .
```

Enables the D59 alarm list entitled “AP1 8GEV”.

 Pbar alarm list 3 after it has been enabled by the Pbar Sequencer. Click on thumbnail to view full-sized image.

```
::: WAIT_FOR SECS 3                .
::: ALARM_LIST PBAR 12             .
```

Enables the D59 alarm list entitled “AP3”. This list consists of two lists “AP3 DGTL” and “AP3 ANLG.”

 Pbar alarm list 12, 13, and 14 after they have been enabled by the Pbar Sequencer.. Click on thumbnails to view full-sized images.

```
::: SET_SEQ FILE 37                .
```

File #37 turns off AP1 120Gev Supplies. All of the devices in this list are located in F23 service building.

```
M:HV100  TURN DEVICE OFF                                    ok
M:Q101   TURN DEVICE OFF                                    ok
M:Q102   TURN DEVICE OFF                                    ok
M:HV102  TURN DEVICE OFF                                    ok
M:Q103   TURN DEVICE OFF                                    ok
M:Q104   TURN DEVICE OFF                                    ok
M:Q105   TURN DEVICE OFF                                    ok
M:V105   TURN DEVICE OFF                                    ok
M:Q106   TURN DEVICE OFF                                    ok
M:Q107   TURN DEVICE OFF                                    ok
M:Q108   TURN DEVICE OFF                                    ok
M:Q109I  TURN DEVICE OFF                                    ok
M:Q109V  TURN DEVICE OFF                                    ok
::: WAIT_FOR SECS 5                .
::: SET_SEQ FILE 41                .
```

File #41 resets AP1 8 GeV devices. This will clear any trip status before turning these supplies on. I:F17B3 is located in the F2 service building, and the rest of the devices in this list are located in the F23 service building.

```
I:F17B3  RESET DEVICE                                       ok
M:HV200  RESET DEVICE                                       ok
M:Q201   RESET DEVICE                                       ok
M:HV202  RESET DEVICE                                       ok
M:Q203   RESET DEVICE                                       ok
M:Q204   RESET DEVICE                                       ok
M:Q205   RESET DEVICE                                       ok
M:V205   RESET DEVICE                                       ok
M:Q206   RESET DEVICE                                       ok
M:Q207   RESET DEVICE                                       ok
M:Q208   RESET DEVICE                                       ok
M:Q209   RESET DEVICE                                       ok
::: SET_SEQ FILE 42                .
```

File #42 turns on AP1 8 GeV devices. I:F17B3 is located in the F2 service building, and the rest of the devices in this list are located in the F23 service building.

```
      I:F17B3  TURN DEVICE ON                                    ok
      M:HV200  TURN DEVICE ON                                    ok
      M:Q201   TURN DEVICE ON                                    ok
      M:VT101  TURN DEVICE ON                                    ok
      M:VT101A TURN DEVICE ON                                    ok
      M:Q102R  SET NEGATIVE                                      ok
      M:Q202   TURN DEVICE ON                                    ok
      M:HV202  TURN DEVICE ON                                    ok
      M:Q203   TURN DEVICE ON                                    ok
      M:Q204   TURN DEVICE ON                                    ok
      M:Q205   TURN DEVICE ON                                    ok
      M:HT105  TURN DEVICE ON                                    ok
      M:V205   TURN DEVICE ON                                    ok
      M:Q206   TURN DEVICE ON                                    ok
      M:Q207   TURN DEVICE ON                                    ok
      M:HT107  TURN DEVICE ON                                    ok
      M:Q208   TURN DEVICE ON                                    ok
      M:VT108  TURN DEVICE ON                                    ok
      M:Q209   TURN DEVICE ON                                    ok
::: SET_SEQ FILE 47                 .
      File #47 resets AP3 line devices.   This will clear any trip status before
trying to turn the supplies on.  Devices in this list are located in AP30 (D:Q901,
D:V901, D:Q903, D:Q907, and D:Q909), F27 (D:Q913, D:Q914, D:Q916, D:Q917,  and
D:Q919), and AP0 (D:H914, D:Q924, D:Q926 and D:H926).
      D:Q901   RESET DEVICE                                      ok
      D:V901   RESET DEVICE
       ok
      D:Q903   RESET DEVICE                                      ok
      D:Q907   RESET DEVICE                                      ok
      D:Q909   RESET DEVICE                                      ok
      D:Q913   RESET DEVICE                                      ok
      D:Q914   RESET DEVICE                                      ok
      D:H914   RESET DEVICE                                      ok
      D:Q916   RESET DEVICE                                      ok
      D:Q917   RESET DEVICE
       ok
      D:Q919   RESET DEVICE                                      ok
      D:Q924   RESET DEVICE                                      ok
      D:Q926   RESET DEVICE                                      ok
      D:H926   RESET DEVICE                                      ok
::: SET_SEQ FILE 48                 .
      File #48 turns on AP3 line devices.  Devices in this list are located in AP30
(D:Q901, D:V901, D:Q903, D:Q907, and D:Q909), F27 (D:Q913, D:Q914, D:Q916, D:Q917,
and D:Q919), and AP0 (D:H914, D:Q924, D:Q926 and D:H926).
      D:Q901   TURN DEVICE ON                                    ok
      D:V901   TURN DEVICE ON                                    ok
      D:HT901  TURN DEVICE ON                                    ok
      D:Q903   TURN DEVICE ON                                    ok
      D:HT906A TURN DEVICE ON                                    ok
      D:VT906  TURN DEVICE ON                                    ok
      D:HT906B TURN DEVICE ON                                    ok
      D:Q907   TURN DEVICE ON                                    ok
      D:Q909   TURN DEVICE ON                                    ok
      D:HT910  TURN DEVICE ON                                    ok
      D:Q913   TURN DEVICE ON                                    ok
      D:Q914   TURN DEVICE ON                                    ok
      D:H914   TURN DEVICE ON                                    ok
      D:Q916   TURN DEVICE ON                                    ok
      D:Q917   TURN DEVICE ON                                    ok
      D:VT917  TURN DEVICE ON                                    ok
```

```
      D:Q919   TURN DEVICE ON                                    ok
      D:Q924   TURN DEVICE ON                                    ok
      D:Q926   TURN DEVICE ON                                    ok
      D:H926   TURN DEVICE ON                                    ok
      D:VT925  TURN DEVICE ON                                    ok
::: INSTRUCT 208                    .
```


```
::: SET_SEQ FILE_SR 79                                             .
File #79 restores AP1 line 8 GeV device settings from a D1 file.   The Pbar
Sequencer Operator is prompted to chose a shot setup file.   Unless told otherwise,
the Pbar Sequencer Operator should choose the last "Shots to Tevatron" save from
the D1 category "SHOTS."   In this example, "SHOTS" D1 file #1193 was chosen.
      M:HV200  RESTORE (D1 file)   SETTING   1193                ok
      M:HT100  RESTORE (D1 file)   SETTING   1193                ok
      M:HT100  RESTORE (D1 file)   ANL ALARM 1193                ok
      M:Q201   RESTORE (D1 file)   SETTING   1193                ok
      M:VT101  RESTORE (D1 file)   SETTING   1193                ok
      M:VT101  RESTORE (D1 file)   ANL ALARM 1193                ok
      M:VT101A RESTORE (D1 file)   SETTING   1193                ok
      M:VT101A RESTORE (D1 file)   ANL ALARM 1193                ok
      M:Q102R  RESTORE (D1 file)   BASIC STS 1193                ok
      M:Q202   RESTORE (D1 file)   SETTING   1193                ok
      M:HV202  RESTORE (D1 file)   SETTING   1193                ok
      M:Q203   RESTORE (D1 file)   SETTING   1193                ok
      M:Q204   RESTORE (D1 file)   SETTING   1193                ok
      M:Q205   RESTORE (D1 file)   SETTING   1193                ok
      M:V205   RESTORE (D1 file)   SETTING   1193                ok
      M:HT105  RESTORE (D1 file)   SETTING   1193                ok
      M:HT105  RESTORE (D1 file)   ANL ALARM 1193                ok
      M:Q206   RESTORE (D1 file)   SETTING   1193                ok
      M:Q207   RESTORE (D1 file)   SETTING   1193                ok
      M:HT107  RESTORE (D1 file)   SETTING   1193                ok
      M:HT107  RESTORE (D1 file)   ANL ALARM 1193                ok
      M:Q208   RESTORE (D1 file)   SETTING   1193                ok
      M:VT108  RESTORE (D1 file)   SETTING   1193                ok
      M:VT108  RESTORE (D1 file)   ANL ALARM 1193                ok
      M:Q209   RESTORE (D1 file)   SETTING   1193                ok
      File #79 also restores AP1 diagnostics setups for SEMs, Toroids, Loss
      Monitors and the AP0 Wall Current Monitor.
      M:SMA1S  RESTORE (D1 file)   SETTING   1193                ok
      M:SMA1S1 RESTORE (D1 file)   SETTING   1193                ok
      M:SMA1C  RESTORE (D1 file)   SETTING   1193                ok
      M:SMA1C1 RESTORE (D1 file)   SETTING   1193                ok
      D:TRSM1S RESTORE (D1 file)   SETTING   1193                ok
      D:TRSM1R RESTORE (D1 file)   SETTING   1193                ok
      D:TRSM1C RESTORE (D1 file)   SETTING   1193                ok
      D:TRSM1D RESTORE (D1 file)   SETTING   1193                ok
      M:TR109S RESTORE (D1 file)   SETTING   1193                ok
      M:TR109T RESTORE (D1 file)   SETTING   1193                ok
      M:LMHLD  RESTORE (D1 file)   SETTING   1193                ok
      M:LMHLDS RESTORE (D1 file)   SETTING   1193                ok
      M:AP1WCS RESTORE (D1 file)   SETTING   1193                ok
      M:AP1WCT RESTORE (D1 file)   SETTING   1193                ok
      M:TR105S RESTORE (D1 file)   SETTING   1193                ok
```

```
      M:TR105T RESTORE (D1 file)   SETTING   1193                  ok
::: SET_SEQ FILE_SR 87    .
      File #87 restores AP3 line device settings from a D1 file.   The Pbar
      Sequencer Operator is prompted to chose a shot setup file.   Unless told
      otherwise, the Pbar Sequencer Operator should choose the last "Shots to
      Tevatron" save from the D1 category "SHOTS."
      D:Q901   RESTORE (D1 file)   SETTING   1193                  ok
      D:Q901   RESTORE (D1 file)   ANL ALARM 1193                  ok
      D:V901   RESTORE (D1 file)   SETTING   1193                  ok
      D:V901   RESTORE (D1 file)   ANL ALARM 1193                  ok
      D:VS901  RESTORE (D1 file)   SETTING   1193                  ok
      D:VS901  RESTORE (D1 file)   ANL ALARM 1193                  ok
      D:HT901  RESTORE (D1 file)   SETTING   1193                  ok
      D:HT901  RESTORE (D1 file)   ANL ALARM 1193                  ok
      D:Q903   RESTORE (D1 file)   SETTING   1193                  ok
      D:Q903   RESTORE (D1 file)   ANL ALARM 1193                  ok
      D:VS904  RESTORE (D1 file)   SETTING   1193                  ok
      D:VS904  RESTORE (D1 file)   ANL ALARM 1193                  ok
      D:HT906A RESTORE (D1 file)   SETTING   1193                  ok
      D:HT906A RESTORE (D1 file)   ANL ALARM 1193                  ok
      D:VT906  RESTORE (D1 file)   SETTING   1193                  ok
      D:VT906  RESTORE (D1 file)   ANL ALARM 1193                  ok
      D:HT906B RESTORE (D1 file)   SETTING   1193                  ok
      D:HT906B RESTORE (D1 file)   ANL ALARM 1193                  ok
      D:Q907   RESTORE (D1 file)   SETTING   1193                  ok
      D:Q907   RESTORE (D1 file)   ANL ALARM 1193                  ok
      D:Q909   RESTORE (D1 file)   SETTING   1193                  ok
      D:Q909   RESTORE (D1 file)   ANL ALARM 1193                  ok
      D:HT910  RESTORE (D1 file)   SETTING   1193                  ok
      D:HT910  RESTORE (D1 file)   ANL ALARM 1193                  ok
      D:Q913   RESTORE (D1 file)   SETTING   1193                  ok
      D:Q913   RESTORE (D1 file)   ANL ALARM 1193                  ok
      D:QS915  RESTORE (D1 file)   SETTING   1193                  ok
      D:QS915  RESTORE (D1 file)   ANL ALARM 1193                  ok
      D:Q914   RESTORE (D1 file)   SETTING   1193                  ok
      D:Q914   RESTORE (D1 file)   ANL ALARM 1193                  ok
      D:H914   RESTORE (D1 file)   SETTING   1193                  ok
      D:H914   RESTORE (D1 file)   ANL ALARM 1193                  ok
      D:Q916   RESTORE (D1 file)   SETTING   1193                  ok
      D:Q916   RESTORE (D1 file)   ANL ALARM 1193                  ok
      D:Q917   RESTORE (D1 file)   SETTING   1193                  ok
      D:Q917   RESTORE (D1 file)   ANL ALARM 1193                  ok
      D:QS917  RESTORE (D1 file)   SETTING   1193                  ok
      D:QS917  RESTORE (D1 file)   ANL ALARM 1193                  ok
      D:VT917  RESTORE (D1 file)   SETTING   1193                  ok
      D:VT917  RESTORE (D1 file)   ANL ALARM 1193                  ok
      D:Q919   RESTORE (D1 file)   SETTING   1193                  ok
      D:Q919   RESTORE (D1 file)   ANL ALARM 1193                  ok
      D:QS919  RESTORE (D1 file)   SETTING   1193                  ok
      D:QS919  RESTORE (D1 file)   ANL ALARM 1193                  ok
      D:VT925  RESTORE (D1 file)   SETTING   1193                  ok
      D:VT925  RESTORE (D1 file)   ANL ALARM 1193                  ok
      D:Q924   RESTORE (D1 file)   SETTING   1193                  ok
      D:Q924   RESTORE (D1 file)   ANL ALARM 1193                  ok
      D:QS925  RESTORE (D1 file)   SETTING   1193                  ok
      D:QS925  RESTORE (D1 file)   ANL ALARM 1193                  ok
      D:HS925  RESTORE (D1 file)   SETTING   1193                  ok
      D:HS925  RESTORE (D1 file)   ANL ALARM 1193                  ok
      D:Q926   RESTORE (D1 file)   SETTING   1193                  ok
      D:Q926   RESTORE (D1 file)   ANL ALARM 1193                  ok
```

```
      D:QS926  RESTORE (D1 file)   SETTING   1193                  ok
      D:QS926  RESTORE (D1 file)   ANL ALARM 1193                  ok
      D:H926   RESTORE (D1 file)   SETTING   1193                  ok
      D:H926   RESTORE (D1 file)   ANL ALARM 1193                  ok
      D:QS928  RESTORE (D1 file)   SETTING   1193                  ok
      D:QS928  RESTORE (D1 file)   ANL ALARM 1193                  ok
      A:EKIKP  RESTORE (D1 file)   SETTING   1193                  ok
      File #87 also restores analog alarms limits for the core horizontal and
      vertical trombones.
      A:CH1T2  RESTORE (D1 file)   ANL ALARM 1193                  ok
      A:CH2T2  RESTORE (D1 file)   ANL ALARM 1193                  ok
      A:CH3T2  RESTORE (D1 file)   ANL ALARM 1193                  ok
      A:CV1T2  RESTORE (D1 file)   ANL ALARM 1193                  ok
      A:CV2T2  RESTORE (D1 file)   ANL ALARM 1193                  ok
      A:CV3T2  RESTORE (D1 file)   ANL ALARM 1193                  ok
::: SET_SEQ FILE 83                .
      File #83 sets core horizontal and vertical cooling to gate off for three
      seconds during reverse proton events injections.
      A:CBPON  SET DEVICE          3                               ok
      A:CBPOFF SET DEVICE          0
       ok
      A:CBPON  SET TIMER REFER     99                              ok
      A:CBPOFF SET TIMER REFER     99
      ok
      A:CBPON  EVENT ENABLE                                        ok
      A:CBPOFF EVENT ENABLE                                        ok
::: CHECK_DEVICE D:R1LLMT SAVE_SET .
      The CHECK_DEVICE command, with the SAVE_SET option, reads and saves the
      current value of a device.  In this case we read and save the value of the
      DRF1 MIBS Master Trigger timer (D:R1LLMT) for when we return to
      stacking.
::: SET_SEQ FILE 85                .
      File #85 is labeled RunIIb Misc. settings.   It sets up the ARF1 fanback
      voltage and phase read back sample and hold trigger timers both to be 1.575
      seconds after a an Accumulator to Main Injector transfer event $9A.
      A:R1HLT1 SET DEVICE          1.575                           ok
      A:R1HLT1 SET TIMER REFER     9A                              ok
      A:R1HLT1 EVENT ENABLE
       ok                                              sets
      A:R1HLT2 SET DEVICE          1.575                           ok
      A:R1HLT2 SET TIMER REFER     9A                              ok
      A:R1HLT2 EVENT ENABLE                                        ok
      File #85 also sets up the ARF1 Accumulator to Main Injector frequency track
      and hold timers to be zero seconds and 0.000211 seconds after a an
      Accumulator to Main Injector transfer event
      $9A.
      A:R1LLT3 SET DEVICE          0                               ok
      A:R1LLT3 SET TIMER REFER     9A                              ok
      A:R1LLT3 EVENT ENABLE
      ok
      A:R1LLT4 SET DEVICE          .000211                         ok
      A:R1LLT4 SET TIMER REFER     94                              ok
      A:R1LLT4 EVENT ENABLE                                        ok
      File #85 also sets the A:IBMS1 sample time to be .1 seconds after an Unstack
      TCLK event ($91) or a Pbar Production TCLK event ($80).

      A:IBMS1  SET DEVICE          .1                              ok
      A:IBMS1  SET TIMER REFER     91  80                          ok
      A:IBMS1  EVENT ENABLE                                        ok
```

File #85 also sets the A:IBMS1 sample time to be 1 second after an Injected Pbar synch event ($94) or a Pbar Production TCLK event ($80).

```
A:IBMS2  SET DEVICE          1                                  ok
A:IBMS2  SET TIMER REFER     94  80                             ok
A:IBMS2  EVENT ENABLE                                           ok
```

File #85 also sets the AP3 SEM clear timer. The 14 6 errors says that the requested data has not changed. This is probably due to the fact that the $9A event is already present and the $E1 event is not present. As a result the timer is already in the correct configuration before the commands are run.

```
D:SMB2C  ADD TIMER EVENT     9A                                 14 6
D:SMB2C  REMOVE TIMER EVNT   E1                                 14 6
```

File #85 also sets the Debuncher Extraction kicker septa charge timer. It changes it from $80 + 0.4 seconds to $90 + 0.00001 seconds.

```
D:ESEPC  SET DEVICE          .00001                             ok
D:ESEPC  ADD TIMER EVENT     90                                 ok
D:ESEPC  REMOVE TIMER EVNT   80                                 ok
```

File #85 also changes the DRF1 Master Trigger time to trigger zero seconds after a TCLK event $02, which goes out every five seconds. This keeps the DRF1 cavities in tune during the shot setup process. When return to stacking the DRF1 master trigger will be returned to triggering off of a MIBS $79 event.

```
D:R1LLMT EVENT DISABLE                                          ok
D:R1LLTT SET TIMER REFER     02                                 ok
D:R1LLTT SET DEVICE          0                                  ok
D:R1LLTT EVENT ENABLE                                           ok
::: EVENT 91 DISABLE                .
```

Disables Accumulator unstack cycle reset.

```
::: WAIT_FOR SECS 10                .
::: CTL_DEVICE M:Q102 RESET         .
```

M:Q102 must have a history of needing multiple reset and on commands as it was already reset (file 41 above) and issued turned on (file 42 above) earlier..

```
::: CTLIT_DEVICE M:Q202   ON        .
```

The CTLIT_DEVICE command both issues and on command to M:Q102 and checks to verify that the device actually turns on. M:Q102 must have a history of needing multiple reset and on commands as it was already reset (file 41 above) and issued turned on (file 42 above) earlier.

```
::: SEQ_PGM REQUEST Acc Gap Mon     .
```

Starts the Pbar GBIP command editor program P188 (keeper is Jim Budlong). The Request qualifier tells the application to load file 6, which is used to setup the Accumulator AP10 gap monitor scope for capturing Pbar unstacking events. The P188 window automatically closes when the file load is complete.

 Acnet application P188. Click on the thumbnail to view a full-sized version of the image.

```
::: ACL COMPARE_10_DEVICES          .
```

Runs an Accelerator Command Language (ACL) script called COMPARE_10_DEVICES that compares ramp table values for I:LAM52, I:V701, I:HV703, I:H703, and I:V714. . More information on ACL scripts can be found at http://adcon.fnal.gov/userb/www/controls/clib/intro_acl.html.

```
::: ACL COMPARE_10_DEVICES          .
```

Runs an Accelerator Command Language (ACL) script called COMPARE_10_DEVICES that compares ramp table values for I:HVF11, I:HVF12, I:F17B3, I:Q701, and I:Q702.

```
::: ACL COMPARE_10_DEVICES          .
```

Runs an Accelerator Command Language (ACL) script called COMPARE_10_DEVICES

that compares ramp table values for I:Q703, I:Q710, I:Q711, I:Q712, and I:Q713.

::: ACL COMPARE_10_DEVICES .

Runs an Accelerator Command Language (ACL) script called COMPARE_10_DEVICES that compares ramp table values for I:Q714, I:F11A, I:F11B, I:QF12, and I:Q703.

::: ACL COMPARE_10_DEVICES .

Runs an Accelerator Command Language (ACL) script called COMPARE_10_DEVICES that compares ramp table values for I:LAM52, I:V701, I:HV703, I:H703M and I:V714.

::: ACL COMPARE_10_DEVICES .

Runs an Accelerator Command Language (ACL) script called COMPARE_10_DEVICES that compares ramp table values for I:HVF11, I:HVF12, I:F17B3, I:Q701, and I:Q702.

::: ACL COMPARE_10_DEVICES .

Runs an Accelerator Command Language (ACL) script called COMPARE_10_DEVICES that compares ramp table values for I:Q703, I:Q710, I:Q711, I:Q712, and I:Q713.

::: ACL COMPARE_10_DEVICES .

Runs an Accelerator Command Language (ACL) script called COMPARE_10_DEVICES that compares ramp table values for I:Q703, I:Q710, I:Q711, I:Q712, and I:Q713.

::: ACL COMPARE_10_DEVICES .

Runs an Accelerator Command Language (ACL) script called COMPARE_10_DEVICES that compares ramp table values for I:Q714, I:HV703, I:H703, I:V7014, I:Q701.

::: CHECK_DEVICE D:EKIKM1 SAVE_SET .

The CHECK_DEVICE command, with the SAVE_SET option, reads and saves the current value of a device. In this case, the Debuncher extraction kicker module #1 timer is saved.

::: CHECK_DEVICE D:EKIKM2 SAVE_SET .

This is the same as the last command, only this time the Debuncher extraction kicker module #2 timer is saved.

::: CHECK_DEVICE D:EKIKM3 SAVE_SET .

This is the same as the last command, only this time the Debuncher extraction kicker module #3 timer is saved.

::: CHECK_DEVICE A:SCRES SAVE_SET .

This is the same as the last command, only this time the Accumulator stack cycle reset timer is saved.

::: SET_DEVICE A:SCRES +=1.8 .

Increments the Accumulator stack cycle reset timer by 1.8 seconds.

::: CHECK_DEVICE A:ISEP1V SAVE_SET .

The CHECK_DEVICE command, with the SAVE_SET option, reads and saves the current value of a device. In this case, the Accumulator injection septum tank #1 voltage setting is saved.

::: CHECK_DEVICE A:ISEP2V SAVE_SET .

This is the same as the last command, only this time the Accumulator injection septum tank #2 voltage setting is saved.

::: ALARM_LIST PBAR 76 .

Bypasses the D59 alarm list entitled "DEB COOL" (Debuncher Cooling). This list contains a number of other lists.

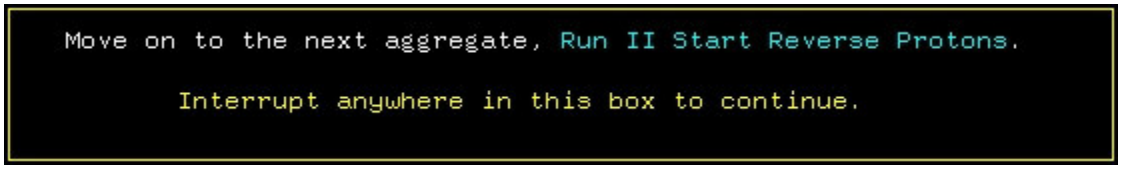
Pbar alarm list 76 after it has been enabled by the Pbar Sequencer. Click on thumbnail to view full-sized image.

::: SET_SEQ FILE 92 .

File #92 opens the Debuncher cooling PIN switches to turn off the Debuncher cooling during the shot setup.

```
      D:H1PS1  TURN DEVICE OFF                                    ok
      D:H2PS1  TURN DEVICE OFF                                    ok
      D:H3PS1  TURN DEVICE OFF                                    ok
      D:H4PS1  TURN DEVICE OFF                                    ok
      D:V1PS1  TURN DEVICE OFF                                    ok
      D:V2PS1  TURN DEVICE OFF                                    ok
      D:V3PS1  TURN DEVICE OFF                                    ok
      D:V4PS1  TURN DEVICE OFF                                    ok

      D:P1PS1  TURN DEVICE OFF                                    ok
      D:P2PS1  TURN DEVICE OFF                                    ok
      D:P3PS1  TURN DEVICE OFF                                    ok
      D:P4PS1  TURN DEVICE OFF                                    ok
ok  INSTRUCT 209                    .
```



Collider Aggregate: **Run II Start Shot Setup** has been completed.
Next Aggregate: Move straight to the Run II Start Reverse Protons aggregate, which has the Pbar Sequencer operator continue to sweep beam to the core, and allows for the start of Main Injector tuneup.
How to get back to stacking: Run the Run II Return to Stacking Aggregate.